

MONTHLY WEATHER REVIEW.

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INTRODUCTION.

The MONTHLY WEATHER REVIEW for April, 1905, is based on data from about 3583 stations, classified as follows:

Weather Bureau stations, regular, telegraph, and mail, 176; West Indian Service, cable and mail, 4; River and Flood Service, regular 52, special river and rainfall, 363, special rainfall only, 98; cooperative observers, domestic and foreign, 2565; total Weather Bureau Service, 3258; Canadian Meteorological Service, by telegraph and mail, 33; Meteorological Service of the Azores, by cable, 2; Meteorological Office, London, by cable, 8; Mexican Telegraph Company, by cable, 3; Army Post Hospital reports, 18; United States Life-Saving Service, 9; Southern Pacific Company, 96; Hawaiian Meteorological Service, 1; Jamaica Weather Service, 130; Costa Rican Meteorological Service, 25. Total, 3583.

Special acknowledgment is made of the hearty cooperation of Prof. R. F. Stupart, Director of the Meteorological Service of the Dominion of Canada; Señor Manuel E. Pastrana, Director of the Central Meteorological and Magnetic Observatory of Mexico; Camilo A. Gonzales, Director-General of Mexican Telegraphs; Capt. S. I. Kimball, Superintendent of the United States Life-Saving Service; Lieut. Commander H. M. Hodges, Hydrographer, United States Navy; H. Pitier, Director of the Physico-Geographic Institute, San José, Costa Rica; Commandant Francisco S. Chaves, Director of the Meteorological Service of the Azores, Ponta Delgada, St. Michaels, Azores; W. N. Shaw, Esq., Secretary, Meteorological Office, London; H. H. Cousins, Chemist, in charge of the Jamaica Weather Office; and Señor Enrique A. Del Monte, Director of the Meteorological Service of the Republic of Cuba.

Attention is called to the fact that at regular Weather

Bureau stations all data intended for the Central Office at Washington are recorded on seventy-fifth meridian or eastern standard time, except that hourly records of wind velocity and direction, temperature, and sunshine are entered on the respective local standards of time. As far as practicable, only the seventy-fifth meridian standard of time, which is exactly five hours behind Greenwich time, is used in the text of the REVIEW. The standards used by the public in the United States and Canada and by the cooperative observers are believed to conform generally to the modern international system of standard meridians, one hour apart, beginning with Greenwich. The Hawaiian standard meridian is $157^{\circ} 30'$, or $10^{\text{h}} 30^{\text{m}}$ west of Greenwich. The Costa Rican standard meridian is that of San José, $5^{\text{h}} 36^{\text{m}}$ west of Greenwich.

Barometric pressures, whether "station pressures" or "sea-level pressures," are now reduced to standard gravity, so that they express pressure in a standard system of absolute measures.

Since December, 1904, the Weather Bureau has received an average of about 1700 reports from as many observers and vessels, giving international simultaneous observations over the Atlantic and Pacific oceans at 12 noon, Greenwich time, or 7 a. m., seventy-fifth meridian time. These are charted, and, with the corresponding land observations, will form the framework for daily weather charts of the globe.

In conformity with Instructions No. 43, March 29, 1905, the designation "voluntary", as applied to the class of observers performing services under the direction of the Weather Bureau without a stated compensation in money, is hereby discontinued, and the designation "cooperative" will be used instead in all official publications and correspondence.

FORECASTS AND WARNINGS.

By Prof. E. B. GARRIOTT, in charge of Forecast Division.

Unusually severe weather prevailed along the transatlantic steamer routes during the first half of April. During the second decade of the month barometric pressure continued low over the eastern Atlantic, and a disturbance moved from the ocean west of the British Isles southeastward over France. Following this disturbance an area of high barometer settled slowly southward over the British Isles and adjacent ocean. After the 24th pressures continued generally low over the British coasts. In the vicinity of the Azores the barometer was low until the 12th, and continued high from that date until the close of the month. Over the western Atlantic low and fluctuating barometric pressure attended the passage of a number of disturbances from the American Continent.

In the United States a remarkable succession of barometric depressions caused exceptionally heavy rains in the Southwest, and during the third decade of the month severe storms of rain and snow in contiguous mountain districts resulted in floods in parts of Arizona and western New Mexico. The eastward advance of depressions from the West and Southwest was attended by extensive rain areas, and followed by frost-producing cool waves of unusual seasonal severity. Destructive winds that attended the depressions were confined principally to squalls that accompanied local storms.

The month opened with heavy rain over the middle and southern Rocky Mountain districts and the Great Plains and heavy snow in the mountains of Wyoming, Colorado, and northern New Mexico. Extending eastward the rain area covered the central valleys and the Lake region on the 2d and 3d, and reached the Atlantic coast on the 4th, where rain continued during the 5th. On the 6th snow fell in parts of New England and the Middle Atlantic States. The precipitation of this period attended low areas I, II, and IV, the tracks of which are traced on Chart II. On the 5th violent local storms occurred in Iredell and Rowan counties, N. C., during the passage of low area IV over that State.

Following the passage of the low areas referred to the temperature fell, and heavy frost occurred on the 7th in the Southern States.

From the 4th to the 10th a disturbance of moderate strength, low area III, crossed the continent, its path being confined almost entirely to the British Northwest Territory and Canada. From the 9th to 11th a disturbance, low area VI, advanced from Wyoming to the middle Atlantic and south New England coasts, attended by an extensive rain area and by thunderstorms in the central valleys and Middle Atlantic States.

On the morning of the 11th two disturbances appeared, one,

low area VII, over Manitoba, and the other, low area VIII, in the lower Rio Grande Valley. The northern disturbance moved slowly eastward over the Lake region to the St. Lawrence Valley by the 13th, and the southern low area passed eastward over the Gulf of Mexico and crossed the Gulf coast line near Pensacola, Fla., attended at that station by a barometer reading of 29.40 inches. By the morning of the 13th this storm had advanced to a position off Hatteras, and by the following morning the northern disturbance and the Gulf storm had apparently united over the ocean between Nova Scotia and Bermuda.

Attending low areas V, VI, IX, and X, unsettled weather prevailed in the Rocky Mountain districts from the 10th to the 15th. During the 14th and 15th the barometer rose rapidly in the Northwest, with a marked fall in temperature from the Rocky Mountains to the Mississippi River, and on the morning of the 15th freezing temperature occurred to northwestern Texas, and snow to southern Missouri.

On the 16th snow flurries occurred in the Ohio Valley and Middle Atlantic States, and on the morning of the 17th freezing temperature was reported in the northern portions of the east Gulf States, and frost as far south as northern Florida. This cool wave foreran high area VI and caused heavy damage to early vegetables and fruit in the east Gulf and South Atlantic States. Warnings of the frosts that occurred on the mornings of the 16th and 17th were issued on the 15th and 16th, respectively. One of the most important storms of the month, low area XII, crossed the United States from California to the southern New England coast from the 17th to 21st, attended by snow and high winds in the middle Rocky Mountain region during the night of the 19th, by an extensive rain area east of the Rocky Mountains, and high winds over the southern Lake region and along the middle Atlantic and south New England coasts. In the rear of this storm high area XIII moved from the British Northwest Territory over the central valleys attended by a cool wave that carried the line of freezing temperature to northern New Mexico and Kansas and caused frost as far south as the Ohio River and Virginia.

Heavy rain set in over the southern Rocky Mountain region during the night of the 22d and extended, with heavy snow and freezing temperature, over the middle Rocky Mountain district by the 23d, where precipitation continued until the morning of the 24th. Low area XIV, which occupied New Mexico during the dates named, moved to western Missouri by the morning of the 25th, carrying the rain area over the Mississippi and lower Ohio valleys and breaking a drought in Missouri. During the 24th and 25th a disturbance, low area XV, advanced from the lower Rio Grande Valley over the northwest portion of the Gulf of Mexico, crossed the Gulf coast line, and merged with the extensive depression that attended low area XIV.

From the 24th to the 29th low area XVI moved slowly from the British Northwest Territory to the St. Lawrence, where it united with low area XVII that had advanced from Nevada. During the night of the 27th low area XVIII, that appeared over western Kansas on the morning of the 27th, united over Kansas with number XVII. The passage of low area XVII was attended by a general rain and thunderstorm area in the central valleys, Lake region, and Eastern States, and by severe local storms, the most important of which was reported at Laredo, Tex., on the 28th, during the apparent development over the Rio Grande Valley of a secondary disturbance, low area XIX, that moved eastward over the Gulf of Mexico by the close of the month.

NEW ENGLAND FORECAST DISTRICT.

There were no marked departures from the averages in the several elements of temperature, pressure, precipitation, and sunshine. Low barometric pressure predominated, the mean, 29.84 inches, being 0.11 of an inch below the normal of the

district. The wind movement was considerably above the average, with a number of cold, blustery days, characteristic of an earlier season. There were no severe storms or destructive gales. Storm warnings were displayed on the 5th, 15th, and the 21st, and there were no storms or high winds for which warnings were not ordered.—*J. W. Smith, District Forecaster.*

CENTRAL FORECAST DISTRICT.

No unusually severe storms crossed this forecast district during the month. Showers were frequent, though no very heavy rainfalls occurred. There were four marked general rain periods, viz, 3d-6th, 10-11th, 21st-22d, and 25-29th. Some damage was done in various localities by thunderstorms the afternoon and night of the 10th. Light frost occurred the 5th to 7th inclusive, 13th, and 15th, and heavy frosts the 8th, 16th, 17th, 18th, and 19th. The only damaging frosts were those of the 16th and 17th, when freezing temperatures were reported in many places. Frost warnings were issued well in advance of the several occurrences, and a special warning of freezing weather on the morning of the 16th. Snow fell on the 16th over the northern portion of the district.—*F. J. Walz, District Forecaster.*

NORTH-CENTRAL FORECAST DISTRICT.

The storm warning season opened on April 15. Previous to that date advisory messages were sent to open ports on Lake Michigan in advance of strong winds. During the latter half of the month the most severe storm which passed over the Lake region was the one that moved eastward from the Pacific coast over the middle Rocky Mountain region, and passed over the central valleys on the 20th and 21st, accompanied by high winds on the southern Lake region. Frost warnings ordinarily are not issued during the month of April in this district, but on account of the abnormally warm weather which prevailed during the latter part of March and the first part of April, advancing vegetation to a marked degree, such warnings were issued at various times, and the forecasts were usually verified. However, it is not thought that much protection could be secured. It is not known that the frosts seriously damaged vegetation, although the growth was much retarded.—*H. J. Cox, Professor and District Forecaster.*

WEST GULF FORECAST DISTRICT.

Several moderate disturbances which moved eastward across the interior of the country influenced weather conditions in the west Gulf States during the month. Brisk to high winds prevailed along the Gulf coast on a few dates, but no severe storms occurred. Warnings were issued for the high winds. Extensive and damaging frosts occurred over the northern portion of the district on the 16th, for which warnings were issued.—*I. M. Cline, District Forecaster.*

ROCKY MOUNTAIN FORECAST DISTRICT.

The month was cold on the eastern slope, while the precipitation was greatest of record for April in southern New Mexico and southeastern Arizona, and was exceeded only in 1900 in southeastern Wyoming, eastern Colorado, and northern New Mexico. High stages were reached in the streams of the eastern slope, and on the 25th notices of high water were sent to points on the lower Rio Grande. There were no cold waves; much colder weather was accurately forecasted for several dates, and freezing temperature for the districts in which vegetation was somewhat advanced.—*F. H. Brandenburg, District Forecaster.*

SOUTH PACIFIC FORECAST DISTRICT.

The month was, as a whole, free from marked disturbances. Over the valley of the Colorado unsettled weather and occasional heavy rains prevailed during the latter half of the month, causing delay to railroad traffic and numerous washouts. In northern California there was considerable cloudy weather, but a rainfall rather below the average. In southern California cloudy, cooler weather prevailed, with conditions favorable

for all crops. Except in southern California, no rain fell in California during the first nine days. On the 10th snow fell in the mountains, and on the 11th showers were general in California south of the Tehachapi. A hailstorm occurred at Los Angeles on April 11th. Moderate disturbances prevailed in California north of the Tehachapi April 15th to 19th. Heavy rain and snow fell in Nevada April 26th.—*A. G. McAdie, Professor and District Forecaster.*

NORTH PACIFIC FORECAST DISTRICT.

The month of April was unusually pleasant in the North Pacific States, and no storms of consequence or destructive winds passed over the district. Sharp frosts occurred on several mornings, doing considerable damage to early fruit and tender vegetables. As a rule, these frosts were accurately forecast.—*A. B. Wollaber, Acting District Forecaster.*

RIVERS AND FLOODS.

Ice disappeared from the rivers of New England and the Red River of the North about the 2d and 3d. There was little trouble from ice gorges. The ice rotted and melted, broke up when the waters began to rise, and passed away without gorging.

The Mississippi River was highest during the early portion of the month, and fell gradually during the last part of the

month. Owing to heavy rains, the tributaries of the Mississippi began to rise at the headwaters during the latter part of the month, but did not reach danger-line stages.

Warnings were issued for the Red River on the 6th, the Trinity, Chichasawhay, Leaf, and Pearl rivers on the 25th, and for the Brazos on the 30th. The first warnings for the Rio Grande, in the new Denver district, were issued on the 25th. The high water was the result of the heavy rains and melting snow in the Southwest during the third decade of the month.

There was considerable snow at the close of April throughout the mountain districts of the Southwest, which may cause a considerable flow of water in the streams of that region as it melts. The snowfall in the northwestern mountain districts is unusually light, and but little water is looked for in the northern streams during the spring and summer.

The highest and lowest water, mean stage, and monthly range at 291 river stations are given in Table VI. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*E. B. Garriott, Professor.*

CLIMATE AND CROP SERVICE.

By Mr. JAMES BERRY, Chief of Climate and Crop Division.

The following summaries relating to the general weather and crop conditions during April are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau; they are based upon reports from cooperative observers and crop correspondents, of whom there are about 3300 and 14,000, respectively:

Alabama.—Weather generally favorable for work and growth, except that the cold of the 17th seriously damaged nearly all crops in northern counties; considerable cotton killed in middle district. Nearly all cotton planted, or replanted, with stands good and chopping well advanced by close of month. Upland corn, wheat, oats, and early and replanted minor crops advanced well. Lowland planting backward. Strawberries yielded well. Fruit a failure north, one-half to two-thirds average crop promised in middle and southern counties.—*F. P. Chaffee.*

Arizona.—Precipitation was largely in excess, and the temperature deficient. Heavy to killing frosts, 2d to 20th, resulted in slight injury to vegetables and fruit. Wheat, barley, and oats were well headed in southern counties last decade; in northern counties these crops were backward, owing to the continued cold and wet weather. All desert cacti blooming by the 25th. Garden truck was plentiful; water in abundance; ranges excellent; stock sleek and fat, with minimum loss. Fruit crop practically safe.—*L. N. Jesunofsky.*

Arkansas.—Excessive rains delayed farm operations over the greater portion of the State. As a result less than usual amount of cotton land was prepared and very little planting was done. Corn planting advanced fairly well and considerable corn was up to fair to good stands. Wheat, oats, potatoes, and grasses made satisfactory progress. Fruits and berries of all kinds were promising, except peaches in northwest portion.—*Edward B. Richards.*

California.—The temperature for the month was nearly normal and the precipitation slightly below average. The snowfall in the mountains was also less than usual. No severe frosts occurred, but the frosts at the close of March injured deciduous fruits considerably, and in some sections they were damaged by high winds and hailstorms during the latter part of April. Large shipments of cherries, strawberries, and asparagus were made to eastern markets.—*Alexander G. McAdie.*

Colorado.—Conditions were generally unfavorable. Excessive moisture retarded work and cold weather delayed germination and growth. Winter wheat remained in fine condition. Spring wheat was nearly all sown and growing nicely. Seeding of oats was well under way, some being up. Planting of sugar beets was backward. Some planting of potatoes was done. Alfalfa did well and grass was generally good. Fruits were backward, but coming into bloom; peach crop is expected to be light.—*F. H. Brandenburg.*

Florida.—Work progressed very well under generally favorable weather conditions. The month was 1° warmer than the normal, with about the average amount of precipitation. Rainfall was greatest in Lee County, and least over western counties of the northern district, where the monthly total was less than one inch. Cotton germinated to generally good stands, although some replanting was necessary as a result of

cold weather. Corn advanced nicely; the early planting in southern counties was in tassel. Citrus trees made a good growth, although the prospects were that the crop would be short.—*A. J. Mitchell.*

Georgia.—The temperature was low on the 7th and below freezing in the northern half of State on the 17th and 18th; most of the fruit and tender vegetation killed; little damage southern half, where the outlook for fruit continued promising. Latter part of month warm. Rainfall well distributed. Spring planting almost completed; early corn up to good stand, being cultivated southern half, making rapid growth; cotton doing well, early planted nice stand, being chopped southern half State, acreage decreased considerably. Oats and wheat unusually fine. All minor crops good.—*J. B. Marbury.*

Hawaii.—Entire month showery and cool. Young cane made only fair progress, its growth being checked somewhat by cool weather. Harvesting and milling of mature cane proceeded rapidly, quality of juice indicating a larger yield of sugar than originally estimated. Plowing and planting for 1907 cane crop continued. Rice heading and ripening in Oahu; a good crop expected. Fruit for summer crop of pineapples developed very satisfactorily. Exceptionally fine coffee blossom during month. Pastures much improved.—*Alex. McC. Ashley.*

Idaho.—The rainfall was very unevenly distributed over the State, but was generally sufficient for crop growth. Farm work made good progress and vegetation at the close of the month was in advance of the season. Range grass was exceptionally good and stock made satisfactory gains. Frost caused some damage to early fruits, and in some instances to apples, but there remained a prospect for a fair to good crop.—*Edward L. Wells.*

Illinois.—Frost forming temperatures pervaded the State on the 16-17th, extending to the furthestmost southern limits. Fruits and tender vegetation were only slightly damaged. The month ended favorably for germination and plant growth. The sowing of oats, begun early in the month, was practically completed at the end of the second decade, and at the end of the month the crop was showing a good stand. Plowing for corn was well advanced the latter part of the month, and some planting had been done. Wheat, rye, and grasses had made good growth and were very promising.—*Wm. G. Burns.*

Indiana.—Sowing oats began during the first week, but, owing to interruptions by snow and rain and delay on account of wet ground, was unfinished at the close. Wheat, rye, and hay crops were in prime condition. Seedling peaches and other fruit promised fair crops. Early potatoes were planted. A little corn was planted, but, owing to wet ground, plowing progressed slowly. An increased acreage of corn was planted.—*W. T. Blythe.*

Iowa.—The mean temperature for the State was slightly below normal and the daily weather was unusually variable. Conditions were favorable for farm operations, except in portions of the southern section, where there was an excess of moisture. Seeding of wheat, oats, barley, and flax was begun early and mostly completed before the 15th. Germination was retarded by brief cold periods, but a fair stand was secured. But little damage to fruit or cereals resulted from frequent frosts.—*John R. Sage.*

Kansas.—Wheat improved, beginning to head in extreme south. Oats